

19692
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INTELLIGENCE MEMORANDUM

A SURVEY OF DEVELOPMENTS IN THE CHEMICAL INDUSTRIES
OF THE SINO-SOVIET BLOC
JANUARY 1958 - MAY 1959

CIA/RR IM 59-10

24 June 1959

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CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

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FOREWORD

This memorandum surveys developments in the chemical industries of the Sino-Soviet Bloc during 1958 and the first 5 months of 1959. The European Satellites are discussed in the order of their importance. Countries in which the chemical industries are not significant are not discussed.

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CONTENTS

	<u>Page</u>
Summary and Conclusions	1
I. Bloc-Wide Developments	4
A. New Plans	4
B. Intra-Bloc Coordination	5
C. Aid from the Free World	7
D. Chemical Production in 1958 ..	10
II. Developments in Each Country . . .	12
A. USSR	12
1. Announcement of the Seven Year Plan (1959-65)	12
a. Introduction	12
b. Synthetics	12
c. Petrochemicals	14
d. Fertilizer	15
2. Other Developments	16
a. Reorganization	16
b. Performance of the Industry	16
3. Outlook	18
B. East Germany	20
1. New Plans	20
a. Increased Emphasis on Chemical Production	20
b. Key Aspects of the Third Five Year Plan (1961-65)	21
2. Other Developments	23
a. Production	23
b. Construction	24
c. Reorganization	24
3. Outlook	25

~~SECRET~~

	<u>Page</u>
C. Poland	26
1. Production in 1958	26
2. New Plans	26
D. Czechoslovakia	28
1. Production in 1958	28
2. New Plans	28
E. Rumania	29
F. Hungary	30
1. Developments in 1958	30
2. New Plans	31
G. Bulgaria	32
1. Production in 1958	32
2. New Plans	32
H. Communist China	32
1. Developments in 1958	32
a. Fulfillment of the Plan for 1958	32
b. Program for Production of Fertilizer	33
c. Synthetic Materials	34
d. Foreign Trade in Chemicals	34
2. Outlook	35
I. North Korea	35

Tables

1. Increases in the Value of Chemical Production and Total Industrial Production in Selected Countries of the Sino-Soviet Bloc, 1958	10
2. Reported Production of Selected Chemical Products in the USSR, 1958	17

A SURVEY OF DEVELOPMENTS IN THE CHEMICAL INDUSTRIES

OF THE SINO-SOVIET BLOC*

JANUARY 1958 - MAY 1959

Summary and Conclusions

Development of chemical industries comparable to those in the Free World became an economic objective of increased importance in the Sino-Soviet Bloc during 1958. In striving to reach this objective the USSR and other countries of the Bloc have intensified their efforts to obtain aid in the form of chemical technology** and equipment from the US, Western Europe, and Japan. Within the Bloc an attempt is being made to utilize all available research, engineering, and facilities for producing equipment in support of the program for expanding the chemical industry.

The increased emphasis on chemicals, particularly synthetics,*** is evident in the Soviet Seven Year Plan (1959-65) and also in plans disclosed by the European Satellites and Communist China. Investment in the Soviet chemical industry in 1959-65 is scheduled to be five times that during 1952-58, even though total industrial investment is to be only twice as great. Twenty percent of the investment in the chemical industry will go to production of plastics, which received only 7 percent during 1952-58, and large allocations of funds are planned for expanding production of synthetic fibers, synthetic rubber, and fertilizer.**** The planned increases in total chemical production by the European Satellites during 1959-65 range from about 100 percent in East Germany, where the program is being given top priority, to 300 percent in Rumania. The Satellites also are emphasizing production of synthetics. In Communist China, where increased priority for the chemical industry was noticeable late in 1957, the main emphasis during the Second Five Year Plan (1958-62)

* The estimates and conclusions in this memorandum represent the best judgment of this Office as of 1 June 1959.

** In this context the term technology generally includes design information, drawings, licenses, knowledge of processes, supervision of the erection of plants and their initial operation, and the training of personnel.

*** The term synthetics in this memorandum refers principally to synthetic fibers, synthetic rubber, and plastics but may also include certain other synthetic products such as paints, detergents, and antifreeze compounds.

**** In this memorandum the term fertilizer excludes organic fertilizer.

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will be on expanding production of fertilizer, although ambitious goals also have been established for synthetic fibers and plastics. The goal for production of fertilizer in 1962 was originally a modest 3 million to 3.2 million metric tons,* but during 1958 it was repeatedly increased until a "leap forward" target of 35 million tons,** equal to the Soviet goal for 1965, was being discussed.

In an effort to make maximum use of resources, the Sino-Soviet Bloc is attempting through the Council for Mutual Economic Assistance (CEMA) and through bilateral agreements to coordinate long-range plans relating to chemical research and development and to production of chemical equipment, chemicals, and chemical raw materials. The USSR and East Germany will collaborate in chemical research and development. Agreements have been concluded for delivery of equipment to the USSR by the Satellites, and, in turn, the USSR will deliver crude oil by pipeline to East Germany, Poland, Czechoslovakia, and Hungary to provide a source of raw materials for production of petrochemicals. Plans have been drawn up to insure adequate supplies of other chemical raw materials such as phosphorus and potassium ores, sulfur, and cellulose. Varying degrees of specialization in production are planned in basic chemicals and chemical products.

Along with the effort to exploit internal resources, the Sino-Soviet Bloc has been seeking increased assistance in the form of chemical technology and equipment from the Free World. The need for Western aid is most acute in production of synthetics, particularly those derived from petroleum and natural gas, although a general shortage of chemical equipment is evident. From US firms, which control much of the petrochemical technology, the USSR, Poland, and Rumania have attempted, largely unsuccessfully, to obtain technology for producing various types of plastics, synthetic rubber, and intermediates from petroleum and natural gas. From Western European and Japanese firms, the Bloc has been seeking, and obtaining in many cases, technology and equipment for producing a wide variety of chemical intermediates and end-products. To help finance such imports, the USSR has been actively seeking credits, particularly in Western Europe. These efforts evidently have met with some success -- the President of the British Board of Trade announced, following the signing of the new Anglo-Soviet trade agreement on 24 May 1959, that the Board of Trade is prepared to guarantee a limited amount of credit extended to the USSR by private British companies.

* Tonnages are given in metric tons throughout this memorandum.

** Throughout this memorandum, tonnages given for fertilizer are on an adjusted gross weight basis unless otherwise stated.

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Increases in the value of chemical production in the Sino-Soviet Bloc during 1958 ranged from 10 percent in East Germany to 56 percent in Communist China. As in previous years, these increases were generally greater than those for total industrial production. In the USSR, the value of production of the chemical and rubber industries increased 13 percent compared with an increase of 10 percent in the value of total industrial production. In the USSR and Communist China, notable increases in production of tires were reported, in the both cases accompanied by increased imports of natural rubber. The rate of increase in production of fertilizer in the USSR slowed noticeably in 1958, but elsewhere in the Bloc some impressive increases were reported, partly as a result of Soviet aid programs.

In view of the problems faced by planners in the Sino-Soviet Bloc in their attempts to accelerate the development of chemical production, underfulfillment of long-range goals is probable. The extent to which the new expansion programs will be implemented depends in part on the results of efforts to obtain technology and equipment from the Free World. Although the Bloc has already arranged for purchase of much technology and equipment, efforts to obtain sorely needed petrochemical technology have not been notably successful. Unless the situation changes radically, underfulfillment of goals for synthetics derived from petrochemicals is likely both in the USSR and in the European Satellites. An indication of the dependence on the Free World for chemical technology and of other problems connected with the new programs is the report that the construction plan for the Soviet chemical industry in 1958 was substantially underfulfilled, the greatest failures apparently occurring in the construction of plants for producing synthetics. Formidable problems are evident also in Communist China, where progress in 1958 toward the ambitious goal for production of fertilizer in 1962 was limited. At this stage the goal appears impossible of attainment. In the USSR, high-level concern about the progress in implementing the program for the chemical industry is suggested by the fact that a report on this subject is scheduled to be presented in June 1959 to the Central Committee of the Communist Party by the State Committee for Chemistry.

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I. Bloc-Wide Developments

A. New Plans

Although chemical production in the Sino-Soviet Bloc expanded rapidly between 1945 and 1958, the pattern of development within the industry was uneven. Investment in the chemical industry during this period was centered chiefly in inorganic chemicals, including fertilizer. Some attention was devoted to expanding the output of coal tar chemicals, dyes, butadiene rubber, and other organic products, but, in contrast with the Free World, little effort was devoted to developing new types of synthetic rubber, plastics, fibers, detergents, and other chemicals. Closely related to the failure of the Bloc to develop new types of synthetics was the failure to exploit natural gas and petroleum as raw materials, a development which was well under way in the US and beginning in Western Europe.

Thus, by late in 1957, planners in the Sino-Soviet Bloc faced a situation which demanded action. As a result of the previous shortsighted investment policy, the chemical industry was not able to provide a sufficient volume of low cost synthetic products possessing, in many cases, the superior or unique properties needed by industry in the age of nuclear energy, guided missiles, and supersonic aircraft. Furthermore, much of the chemical processing in the Bloc was by obsolete high-cost methods which consumed vast quantities of scarce resources, notably agricultural products and electric power.

In order to correct this unfavorable situation, new or revised plans for the expansion of the chemical industry have been announced since late in 1957 by almost all of the countries of the Sino-Soviet Bloc. The major objectives of the new plans are to speed up the development of synthetics, fertilizer, and petrochemicals and to effect smaller but substantial increases in other sectors. The Soviet economic plan for 1958 provided for a 68-percent increase in investment in the chemical industry. Under the Seven Year Plan (1959-65), investment is scheduled to be about five times that during 1952-58 compared with a doubling in total industrial investment. Production is scheduled to increase almost 200 percent compared with an 80-percent increase in total industrial production. About three-fourths of the investment funds allocated to the industry have been earmarked for expanding production of synthetics and fertilizer. Plastics alone will get 20 percent of total investment in the chemical industry, compared with only 7 percent in the preceding 7-year period.

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Taking their cue from the USSR, the European Satellites also have announced ambitious plans for the chemical industry in 1959-65. Following a CEMA conference in November 1958 it was stated in the press:

Continued industrial development necessitates an even more rapid rate of growth of the chemical industry in the CEMA partner states, particularly in production of mineral fertilizer, plastic materials, synthetic rubber, and chemical fibers.

Subsequently, in December 1958, the following planned levels of chemical production in 1965 relative to 1958 were announced: Rumania, four times; Bulgaria, 3.8 times; Poland, 2.5 times; Czechoslovakia, 2.1 times; Hungary and East Germany, two times. In Communist China, under the Second Five Year Plan (1958-62), a very rapid expansion in chemical production is scheduled, particularly in production of fertilizer and synthetics.

B. Intra-Bloc Coordination

The increased emphasis on chemicals in national economic plans has been accompanied by efforts to achieve closer coordination within the Sino-Soviet Bloc in this field. These efforts culminated in a plenary meeting of CEMA in Prague from 11 through 13 December 1958, at which the council discussed a report of its permanent commission on chemicals* dealing with "development, specialization and cooperation in the production of plastic materials, synthetic rubber, chemical fibers, and fertilizer." During 1958 a large number of planning conferences were held, including conferences between the chemical and machine building commissions on the question of supplying chemical equipment. Bilateral agreements have been concluded between the USSR and the key Satellites, especially East Germany, for coordination of activities relating to chemical production. The importance of the Soviet-East German agreement and the over-all plans for development of the chemical industries of the Bloc was emphasized in a speech by Khrushchev in July 1958 at the Bitterfeld Chemical Combine in East

* The commission, known officially as the Permanent Commission for Economic, Scientific, and Technical Cooperation in the Chemical Industry, held its first conference on 8 October 1956. Earlier efforts in the chemicals field had been confined mostly to coordinating plans for foreign trade, but during 1957 an increasing interest in the coordination of production of plastics was evident.

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Germany. Full details on the new Bloc program for collaboration in the chemical industry have not been released, but evidently plans have been drawn up for increased coordination of production, research and development, and supply of equipment.

The most publicized aspect of the collaboration in chemical production within the Sino-Soviet Bloc is the plan to begin the development of petrochemical industries, based on Soviet oil delivered by pipeline, in East Germany, Czechoslovakia, Poland, and Hungary.* Byproducts of petroleum refining should provide a more economical basis than calcium carbide derived from coal or agricultural products for the manufacture of plastics, synthetic fibers, synthetic rubber, and other products. A large portion of the technology involved, however, will have to be obtained from the Free World. Steps also will be taken to insure adequate supplies of other chemical raw materials in the Bloc. The USSR will increase deliveries of apatite, a source of phosphorus, for production of fertilizer. In this connection, a Polish radiobroadcast reported that an enterprise would be built on the Kola Peninsula to serve the needs of Poland, East Germany, and Czechoslovakia. Poland will supply sulfur, the USSR and East Germany will increase shipments of potassium salts, and Rumania will export cellulose. Varying degrees of specialization in production are planned in basic chemicals and chemical products, depending on technical capabilities, requirements, and the availability of raw materials. In view of the great variety of synthetic materials, coordination of plans for production is being emphasized.

With respect to research and development, a serious attempt will be made to pool resources. In particular, the USSR wants to make greater use of the East German potential. Khrushchev, in a speech at the Bitterfeld Chemical Combine in East Germany in July 1958, discussed the question of "uniting our efforts in the field of development of science and technology, in the field of engineering, technical activity, and designing." There is evidence also of Hungarian participation. A recent report stated that before 1958 there had been little or no cooperation between Hungary and the USSR in chemical research and development but that the USSR now wants to make use of Hungarian chemical research institutes and engineering facilities. Hungary reportedly is designing a number of chemical plants for the USSR, in one case employing a process developed by Hungarian researchers.

* In Rumania the development of a petrochemical industry based on indigenous resources is already under way. In Western Europe a very rapid expansion of production of petrochemicals has taken place in the last few years.

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The supply of chemical equipment will be a critical bottleneck in the drive to develop the chemical industries of the Sino-Soviet Bloc, and it is evident that efforts will be made to utilize all available capacity in the Bloc for producing chemical equipment. Underscoring the critical nature of the problem of supplying chemical equipment as well as the need for cooperation, the Chairman of the Polish Planning Commission, in discussing Polish plans for 1959-65, stated:

Placing import orders for chemical apparatus in Socialist countries will be a difficult matter due to the fact that all those countries envisage a considerable development of their own chemical industry. For this reason, production specialization and cooperation between member-countries of [CEMA] in the field of producing installations and equipment for the chemical industry, including equipment for refining oil, will be all the more important for solving that problem.

Concern with the developing shortage of chemical equipment also was evident in the CEMA meetings held during 1958 on the subject.

Special emphasis is evident on the delivery of equipment to the USSR. Khrushchev, in a speech of May 1958 outlining plans for the Soviet chemical industry in 1959-65, said that the USSR hoped to get increased quantities of chemical equipment from the Satellites. Czechoslovakia has signed an agreement to deliver 1.9 billion rubles* worth of chemical equipment to the USSR during 1959-65. East Germany, Poland, and Hungary also are scheduled to supply chemical equipment.

C. Aid from the Free World

Along with the effort to exploit the resources of the Sino-Soviet Bloc to the fullest extent, an accelerated campaign is underway to buy technology and equipment from the Free World. The need for Western aid is most acute in production of synthetics, particularly from petroleum and natural gas, an area in which a serious lag

* The official rate of exchange, 4 rubles to 1 US dollar, may not be an accurate reflection of the dollar value.

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in Bloc technology has developed.* In referring to this problem, Khrushchev stated in May 1958:

We will need a large amount of equipment which must be designed and produced anew. It would also be expedient to order a part of this equipment in capitalist

* A good example of the lag in petrochemical technology in the Sino-Soviet Bloc and the economic significance of this lag is in the manufacture of synthetic rubber, specifically those types derived from butadiene. According to Soviet estimates, the cost of producing butadiene-styrene rubber from calcium carbide is 10 to 25 percent more, and from ethyl alcohol obtained from agricultural products it is 200 percent more, than the cost of producing it from petroleum by the new so-called direct processes. When ethyl alcohol is obtained from petroleum rather than from agricultural products, the cost of the rubber probably is about 50 to 100 percent greater than the cost by the direct processes. With the exception of a small quantity of butadiene produced from calcium carbide in West Germany, the butadiene produced in the Free World is by the direct processes from petroleum or natural gas.

In the USSR, which along with Germany led the world in production of synthetic rubber before World War II, much of the butadiene still is produced from ethyl alcohol derived from grain, potatoes, and molasses, although conversion to a less costly process using alcohol derived from petroleum is now under way. The USSR has not yet been able to complete and put into operation its first plant that is to employ a direct process at Sumgait. This process presumably is one developed by Soviet chemical engineers because the USSR has not obtained a direct process from the US. In East Germany, all production of butadiene is based on calcium carbide, which requires large inputs of electric power for its manufacture. Obsolescent Soviet and East German technology is being passed on to other countries of the Bloc. Calcium carbide is to be the starting material in two plants now under construction, one in Poland and the other in Communist China. Alcohol derived from petroleum is to be used in two additional plants, one in Czechoslovakia and the other in Communist China. On the other hand, the USSR reportedly is helping Rumania to build a plant employing a direct process, presumably similar or identical to that at Sumgait. For further details on developments in the synthetic rubber industry of the Bloc, see II, p. 12, below.

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countries, primarily the US, West Germany, and Britain.*

As a followup to his speech in May, Khrushchev mentioned chemical equipment in his letter of June 1958 to President Eisenhower on increased trade between the US and the USSR.

Following Khrushchev's policy pronouncements, the efforts of the Sino-Soviet Bloc to obtain technology and equipment from the Free World were accelerated. The countries of the Bloc have been attempting to buy petrochemical technology from the US because US firms have proprietary control over much of the advanced technology, but their efforts have been largely unsuccessful. The USSR, Poland, and, to a lesser extent, Rumania have tried to obtain technology for producing various types of plastics, synthetic rubber, and intermediate chemicals from petroleum and natural gas. The USSR, Poland, Rumania, and Czechoslovakia have been seeking and, in some cases, obtaining assistance from Western European firms in the form of technology, complete plants, and miscellaneous equipment for producing a wide range of chemicals, and chemical products, including basic and intermediate petrochemicals, chlorine, caustic soda, cellulose, rayon, cellophane, plastics, synthetic fibers, synthetic rubber, and tires. The USSR and more recently Poland have been negotiating for the purchase of Japanese chemical equipment and technology.

In order to pay for growing imports of chemical equipment and goods, the USSR has stepped up its exports to Western Europe, notably of petroleum. The demand for equipment from the Free World, however, is evidently greater than the ability of the USSR to finance such purchases through exports, and the USSR is actively seeking credits, particularly in Western Europe. These efforts evidently have met with some success, as the President of the British Board of Trade announced after the signing of the new Anglo-Soviet trade agreement on 24 May 1959, that the Board of Trade, through its regular facilities, is prepared to guarantee a limited amount of credit extended to the USSR by private British companies.

* In a less publicized speech a month before, the Soviet delegate to the Economic Commission for Europe, taking the same approach taken by Khrushchev, appealed for an exchange of technology in the synthetics field, strongly emphasizing the importance of synthetics for consumer goods.

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D. Chemical Production in 1958

The chemical industries of the Sino-Soviet Bloc made substantial progress in 1958. Increases in the value of chemical production ranged from 10 percent in East Germany to 56 percent in Communist China, as shown in Table 1. In East Germany and North Korea the percentage increase in chemical production was less than the percentage in

Table 1

Increases in the Value of Chemical Production
and Total Industrial Production in Selected Countries
of the Sino-Soviet Bloc^a / 1958

Percent b/

Country	Chemical Production c/	Total Industrial Production
USSR	13	10
East Germany	10 d/	11
Poland	16	10
Czechoslovakia	11	11
Rumania	19	10
Hungary	19 e/ f/	15 e/
Bulgaria	22	16
Communist China	56 g/	40 g/
North Korea	24 g/	40

- a. From official indexes unless otherwise noted.
- b. The increase in the value of production in 1958 as a proportion of the value of production in 1957.
- c. Including the rubber industry.
- d. Including production of synthetic motor fuels and lubricants.
- e. State industry only. Percentages are based on net value of production.
- f. Including the petroleum and aluminum industries.
- g. Estimated.

increase in total industrial production, and in Czechoslovakia it was about equal. In the other countries of the Bloc, growth of chemical production was greater than that of total industrial production. In the USSR, the value of production of the chemical and rubber industries reportedly increased 13 percent compared with a 10-percent increase in the value of total industrial production. Increases in

chemical production above the average for all industry have been a characteristic feature of economic development in the postwar period in both the Bloc and the Free World.

Increases in production of fertilizer in the Sino-Soviet Bloc varied widely in 1958. In the USSR, production increased only 6 percent to 12.4 million tons, less than the reported increases of 7 percent in 1957 and 13 percent in 1956. In the first quarter of 1959 production of fertilizer increased only 2 percent. The current rate of expansion is far out of line with an original goal of 16.5 million to 18.5 million tons of capacity by 1959 and the newly announced goal for production of 35 million tons in 1965. Elsewhere in the Bloc, some notable increases in production of fertilizer were recorded. In East Germany and Poland the increases were modest, but in the remaining countries of Eastern Europe and in the Far East increases ranged from 20 percent in Czechoslovakia to 63 percent in Communist China. These impressive increases, in many cases from low levels of production, are partly the result of Soviet aid programs.

In the rubber industry, Soviet production of tires increased 13 percent, the largest increase reported for any major chemical product, and Communist Chinese production reportedly increased 97 percent. These increases in production of tires have been accompanied by increased imports of natural rubber by both countries.* A press report noted that as a result of expansion in the rubber industry Chinese demand for natural rubber increased more than 80 percent in 1958. In the USSR, increased imports of natural rubber may reflect a lagging program for production of synthetic rubber in addition to increased requirements for current use and stockpiling. Of interest in this connection is the Soviet plan to produce polyisoprene, a synthetic rubber almost identical to natural rubber, in sufficient quantities so that by 1965 imports of natural rubber will not be necessary.**

Notable achievements in production of synthetics in the Sino-Soviet Bloc during 1958 were few. From the Soviet announcement of plan fulfillment, shortcomings in production of plastics and synthetic fibers can be inferred. Moreover, a percentage increase in production of synthetic rubber was not reported, and serious difficulties may have been encountered in this sector. Aside from a reported 13-percent increase in production of synthetic rubber in East Germany to a level above the goal for 1960, reports of significant advances were absent. In Poland, unsuccessful attempts were

* Communist China reexports some natural rubber to other countries of the Sino-Soviet Bloc, including the USSR.

** In the US, production of polyisoprene on a limited scale began in 1959.

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made to get production of synthetic rubber under way at a large plant built with Soviet aid.

Reflecting the lag in the production of synthetics in the Sino-Soviet Bloc, exports by the USSR and Poland of benzene and certain other basic organic coal chemicals used in production of synthetics continued at a high level in 1958. Soviet exports of benzene to the US, which account for a substantial share of the total value of Soviet exports to the US, were given a great deal of publicity in the US press following the announcement by a US chemical firm of plans to buy large quantities of Soviet benzene in 1959-60.

II. Developments in Each Country

A. USSR

1. Announcement of the Seven Year Plan (1959-65)

a. Introduction

The Seven Year Plan (1959-65) assigns a high priority to the rapid expansion of chemical production, as foreshadowed in a speech by Khrushchev in May 1958 before the Central Committee. The plan calls for production of chemicals by 1965 to be almost three times that in 1958 compared with a planned increase of 80 percent in total industrial production. Although the planned rate of growth in the chemical industry is not strikingly different from that achieved under the Fifth Five Year Plan (1951-55), it is very ambitious when compared with the rather modest achievements in 1956-58. Between 100 billion and 105 billion rubles are to be invested in the chemical industry during 1959-65, five times the investment during the previous 7-year period (1952-58). In comparison, total investment in industry is scheduled to double. Key aspects of the new plan for chemicals include rapid development of production of synthetics and fertilizer and exploitation of petroleum and natural gas as chemical raw materials.

b. Synthetics

More than half the planned capital investment of 100 billion to 105 billion rubles in the chemical industry has been allocated to the expansion of production of synthetics.* Although it

* On the basis of a recent article in a Soviet journal, it is estimated that about 34 billion to 45 billion rubles will be invested in facilities for producing synthetics (including artificial fibers) and 16 billion more rubles in facilities for processing these materials.

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possesses the world's second largest chemical industry, the USSR ranks only fifth in production of plastics and sixth in production of chemical fibers* and produces less than one-third as much synthetic rubber as does the US. The scheduled investment is expected to raise production of plastics in 1965 to more than seven times that in 1958; of chemical fibers, four times; and of synthetic rubber, more than 2.5 times.** Production of polyethylene and polypropylene, versatile plastics with broad consumer, industrial, and military uses, is scheduled to increase 246 times in the 7-year period. These goals, even if achieved, would not result in production greater than that of the US; although production of the major synthetic products might approach the level attained in the US in 1956 or 1957.

The plan for production of synthetic rubber fore-shadows a change in Soviet foreign trade. By 1965, polyisoprene rubber, which has properties very similar to those of natural rubber, is scheduled to constitute almost 25 percent of the total production of synthetic rubber; and Fedorov, Chairman of the State Committee for Chemistry, stated that fulfillment of the plan would enable the USSR to eliminate the importation of natural rubber. Soviet sources emphasize, however, that considerable technical difficulties must still be overcome before commercial production can be attained in the USSR.***

From the Soviet point of view the emphasis on expansion of production of synthetics is clearly justified. More and better synthetic materials are required to improve the range and quality of products for consumers and industry. Also, in recent years, synthetic materials have received increased attention from the military forces, which can use the heat resistance, light weight, and electrical properties of many synthetics to good advantage in the manufacture of radar, missiles, and high-speed aircraft. In addition, some types of synthetic rubber and plastic are now used as fuel-binders in solid propellants for missiles. In connection

* The term chemical fibers in this memorandum includes synthetic and artificial fibers. The term artificial fibers refers to the type produced from regenerated cellulose, generally called rayon.

** This goal for production of synthetic rubber was given in May 1958 in a speech by Khrushchev to the Central Committee. According to the drafts of the Seven Year Plan, the capacity for production of synthetic rubber in 1965 is to be 3.7 times that in 1958, indicating that the goal announced by Khrushchev may have been raised when the Seven Year Plan was drawn up.

*** In the US, production of polyisoprene on a limited commercial scale began in 1959.

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with missiles, Khrushchev stated that it would have been impossible to launch the sputniks and the first artificial planet without both synthetic polymeric materials and synthetic fuels. Furthermore, the lack of adequate synthetic materials has been costly to the Soviet economy. For example, a reported annual saving of 2 billion to 2.5 billion rubles could be effected by the use of improved types of synthetic rubber and the substitution of synthetic cord for cotton in the manufacture of tires. Lack of synthetics also has necessitated the use of expensive metals in many applications for which the cheaper synthetics, particularly plastics, are ideally suited. A recent article in a Soviet journal reports that the use of synthetic materials under the Seven Year Plan could result in a saving of 44 billion rubles in capital investments and 51 billion rubles in operational outlays, with attendant savings of more than 300,000 tons of nonferrous metals and more than 500,000 tons of ferrous metals.

c. Petrochemicals

The Seven Year Plan calls for vastly expanded use of petroleum and natural gas as raw materials for the chemical industry. In contrast with the US chemical industry, the Soviet chemical industry has, to date, produced only limited quantities of a few chemicals, notably ethyl alcohol, from petrochemical raw materials. As an indication of the magnitude of the new program, annual consumption of liquified gases, natural gasoline, and natural gas* by the chemical industry is scheduled to increase about 19 times during the period from 1959 to 1965.

Among the basic and intermediate chemicals which are scheduled to be derived wholly or partially from petrochemical sources are ethylene, propylene, acetylene, butadiene, phenol, ammonia, ethyl alcohol, and acetone. From these chemicals will be produced such items as plastics, synthetic rubber, synthetic fibers, fertilizer, and detergents. The dramatic nature of the change in the raw material base is illustrated in the following tabulation, which gives the planned changes in the use of raw materials for synthetic rubber in percentages of synthetic rubber to be derived from each raw material.**

* Excluding natural gas produced in association with crude oil. In 1965 the chemical industry is scheduled to consume 8.5 billion cubic meters of natural gas, including associated gas, out of a total planned production of 150 billion cubic meters.

** Data are approximations only. Minor amounts of some raw materials evidently are not included.

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Basic Raw Material 1958 1959 1965

	1958	1959	1965
Ethyl alcohol	92	86	20
Normal butane	0	6	35
Isobutane	0	0	10
Isopentane	0	0	20
Acetylene (from calcium carbide)	7	6	4
Acetylene (from hydro-carbon gases)	0	0	8

The shift to production of chemicals from petroleum and natural gas should result in considerable savings to the Soviet economy. Conversion to the use of petrochemical raw materials in production of synthetic rubber and ammonia fertilizer alone reportedly will save more than 5 billion rubles in 1959-65. As recently as 1957, more than 1.7 million tons of high-cost edible products* were used to produce industrial ethyl alcohol (used in the manufacture of synthetic rubber), and almost 400,000 tons of edible vegetable oils were used to produce soap.

Chemical Fertilizer

Renewed emphasis on the fertilizer industry, long a preferential sector of the Soviet chemical industry, is evident in the new Seven Year Plan. Whereas production in recent years has been increasing at a rate far less than that required to reach original goals of 16.5 million to 18.5 million tons of capacity by 1959 and 28 million to 30 million tons by 1964, the goal under the new plan is 35 million tons in 1965. Attainment of this new goal will require an investment of 20 billion to 25 billion rubles, one-fifth to one-quarter of the total investment planned for the chemical industry during 1959-65. The boosted goal for production of fertilizer may have been the result of a last-minute decision, inasmuch as Gosplan has indicated that supplemental funds will be required for expanding production of fertilizer.

In spite of the ambitious goal, agricultural requirements for fertilizer in 1965 will not be satisfied even if the plan is fulfilled. Agriculture is scheduled to receive 31 million tons of fertilizer in 1965. Reportedly, 31 million tons of fertilizer would satisfy requirements for the basic technical and subtropical crops and permit a fivefold increase in consumption of fertilizer for other crops.** However, Soviet agricultural specialists have estimated

* In terms of grain.

** Ten million tons of fertilizer reportedly will be needed in 1965 for the basic technical crops.

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that optimum needs for fertilizer will be considerably greater than 31 million tons. The All-Union Academy of Agricultural Science imeni V.I. Lenin estimated, before the announcement of the new plans for production of fertilizer, that "minimum" requirements would be 45 million tons by 1965. Other Soviet institutes have estimated that "potential" requirements would be 70 million to 75 million tons by 1975.

Ultimate satisfaction of agricultural requirements for fertilizer will depend not only on increased production but also on improved distribution and storage facilities. A lack of adequate storage has led to large losses of fertilizer, in some cases amounting to 20 percent of the amount delivered.

2. Other Developments

a. Reorganization

The reorganization of the administrative apparatus of the Soviet chemical industry also was a significant development in 1958. The Ministry of the Chemical Industry had been retained following the reorganization of Soviet industry in mid-1957, although operating control of its producing plants was transferred to the Councils of the National Economy. Subsequently, in June 1958, the Ministry was reorganized into the State Committee for Chemistry under the Soviet Council of Ministers. Little is known of the new State Committee except that it is responsible for technical guidance of the chemical industry, a stated function of its immediate ministerial predecessor.

b. Performance of the Industry

The value of production by the Soviet chemical industry reportedly increased 13 percent in 1958. Preterm fulfillment of the plan for 1958 was reported for fertilizer, sulfuric acid, synthetic ammonia, caustic soda, soda ash, synthetic rubber, and motor vehicle tires. Overfulfillment of the plan was reported for the basic types of plastics and chemical fibers, but the terminology used suggests that the plan for total production of these items may have been underfulfilled. The 6-percent increase in production of fertilizer is to be compared with a 7-percent increase in 1957 and a 13-percent increase in 1956. In the first quarter of 1959 the increase was only 2 percent. The reported Soviet production of selected chemical products in 1958 is shown in Table 2.*

* Table 2 follows on p. 17.

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Table 2

Reported Production of Selected Chemical Products
in the USSR
1958

Product	Unit	Production	Proportion of Production in 1957 (Percent)
		Amount	
Fertilizer	Thousand metric tons	12,400	106
Sulfuric acid	Thousand metric tons	4,800	105
Chemical fibers	Thousand metric tons	166	112
Motor vehicle tires	Million units	14.4	113
Ethyl alcohol	Million decaliters	163	104

The plan for investment was underfulfilled by 15 percent in 1958, and only one-third of the installations scheduled to be put into operation in 1958 actually went into operation. The greatest failure apparently occurred in the construction of plants for production of synthetics. The major causes of the underfulfillment were the inadequate provision of equipment, supplies, and technical documentation, the lack of advanced technology, and the unsatisfactory work of contractors. A contributing factor probably was insufficient coordination between the chemical and petroleum industries.

Soviet progress during 1958 in the development of the petrochemical industry was slow. Lack of equipment delayed completion of petrochemical facilities for production of synthetic rubber at Sumgait and Voronezh. Similarly, lack of both equipment and technical data retarded construction of facilities for production of polyethylene. Most of the completed petrochemical units were experimental or pilot plants. An experimental shop for production of acetylene from natural gas was completed at Saratov, and an experimental unit for production of caprolactam from oil by photosynthesis was installed at Kirovakan. In addition, a few experimental polyethylene shops were commissioned. The introduction of petrochemical processes on a commercial scale during 1958 apparently was limited to the conversion of part of the Stalinogorsk Chemical Combine to the use of natural gas as a source of hydrogen for the manufacture of ammonia and to the initiation of production of synthetic ethyl alcohol at Groznyy.

A move which probably will result in improved coordination between the petroleum and chemical industries was the replacement in mid-1958 of S.M. Tikhomirov, Chairman of the newly formed State Committee for Chemistry, by V.S. Fedorov, a former Deputy Minister of the Petroleum Industry.

Notable developments in Soviet trade in chemicals and related materials during 1958 included a rapid increase in imports of natural rubber from Southeast Asia and a continuing high level of exports of benzene to the US. Since 1954 the USSR has rapidly increased its imports of natural rubber, probably to replace depleted stockpiles and to atone for the failure to expand synthetic rubber capacity to the desired levels. From less than 500 tons in 1954, imports of natural rubber rose to more than 140,000 tons in 1956 and 1957 and are estimated to have exceeded 200,000 tons in 1958. A report from Singapore early in 1959 notes that the USSR has shifted its buying to lower grades of rubber. Since high-grade rubber usually would be used for stockpiles, this shift may mean that Soviet stockpiles of natural rubber are now at a satisfactory level.

According to the US Department of Commerce, Soviet exports of benzene to the US, which averaged 87,000 tons annually during 1955-57, totaled 83,000 tons in 1958. Late in 1958 a US firm announced that it would purchase 90,000 tons of benzene annually from the USSR in 1959-60 at a price somewhat less than that of US producers. The initial press reports, which exaggerated the price differential and which generally did not mention previous shipments of Soviet benzene to the US, suggested that the Soviet motive was economic penetration. In fact, the USSR currently has a substantial surplus of benzene because the quantities which are recovered as a byproduct of coking operations are substantially in excess of Soviet requirements for the lagging synthetic organic chemical industry. Although Soviet exports of benzene will decline eventually unless additional quantities of benzene are produced from petroleum sources, a recent report indicates that exports to the US in 1959 will exceed 100,000 tons.

3. Outlook

Lagging construction probably will continue to harass the Soviet chemical industry during 1959, when investment is scheduled to be 71 percent greater than in 1958. Major delays again can be expected in the construction of plants to produce synthetics. Although imports of chemical plants and equipment probably will increase during 1959, a continuing shortage of equipment can be anticipated. Nevertheless, production probably will increase during 1959 at a rate approximately the same as that in 1958.

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The long-range prospects for development of the Soviet chemical industry are promising, although goals for 1965, particularly those for production of synthetics and fertilizer, appear to be too ambitious. Attainment of the goals hinges largely on progress in petrochemicals, a field in which the USSR has not yet demonstrated a high capability and in which foreign purchasing efforts have not been notably successful. Also, shortages of adequately trained manpower may hamper growth of the industry. During the early years of the Seven Year Plan, increases in chemical production probably will be below the annual rate required to meet the plan, but higher rates of growth can be expected by 1962 or 1963. Even without attainment of the goals the increase in chemical production will be significant, however, improving Soviet capabilities for production of advanced military materiel such as missile parts, propellants, and radar and providing a firm foundation for increases in production of industrial and consumer goods.

Of the goals for production of synthetics in 1965, the goal for production of chemical fibers appears most attainable. The USSR has already arranged for purchase of several fiber plants from the Free World, and such purchases probably will continue. By contrast, the goal for production of plastics appears too ambitious, even granting some importation of Western plants and equipment. Furthermore, it is doubtful that the USSR will attain the goal for production of polyisoprene rubber or the goal for production of all types of synthetic rubber. Fulfillment of the goal for production of fertilizer also is doubtful. As with synthetics, the lack of equipment will continue to hamper expansion of the fertilizer industry. The goal for production of tires appears fairly reasonable. The USSR has already arranged for the importation of a large, highly automated tire plant.

Considerable progress can be expected in the automation and mechanization of the Soviet chemical industry, particularly in enterprises producing synthetic materials and fertilizer. Even a modest effort to improve mechanization will provide opportunity for a significant increase in labor productivity. A delegation of US specialists in plastics visiting the USSR in June 1958 concluded that a large saving in manpower was possible by minor improvements in mechanization.

High-level concern about the progress in implementing the Soviet program for the expansion of the chemical industry is suggested by the fact that a report on this subject is scheduled to be presented by the State Committee for Chemistry to the Central Committee in June 1959.

B. East Germany

1. New Plans

a. Increased Emphasis on Chemical Production

While addressing an East German audience in July 1958, Khrushchev publicly called for the support and cooperation of East Germany with the USSR in the expansion of the chemical industries of both countries. He spoke of "the necessity of uniting the efforts of the German people with those of the people of the USSR" and added:

To coordinate our efforts, to use more rationally the material resources of our countries with a view to achieving a speedy development of the chemical industry, we must... give careful thought to... cooperation and specialization of production processes.

East German Deputy Premier Walter Ulbricht was more specific in his report on the following day to the Fifth Party Congress of the Socialist Unity (Communist) Party (SED), when he outlined an ambitious program for expansion of the chemical industry under the Third Five Year Plan (1961-65). According to his statements, gross production of the chemical industry was to increase by more than 60 percent during the period, with particular emphasis on plastics. Later statements in the East German press noted that synthetic fibers also were to be a key item in the expansion.

Ulbricht also mentioned that the USSR was going to deliver important materials to East Germany to aid in the projected expansion program and announced a plan to build both an oil pipeline to East Germany and a new refinery to process Soviet oil into fuels and chemical raw materials. This announcement was the first indication of the intention to shift the East German chemical industry gradually away from the use of calcium carbide as a starting material for production of synthetics and to establish a modern petrochemical base for this type of production.

During the months which followed these two speeches, the chemical industry, the supporting industries such as the machine building industry, and the Party organizations began to work out the concrete details of the program. In November, Ulbricht gave another speech, in which he spelled out in considerable detail the tasks to

be accomplished. By the end of 1958 the initial stages of the program appeared to be in full swing.

b. Key Aspects of the Third Five Year Plan (1961-65)*

In production of plastics and synthetic fibers, East Germany is among the leading producers in the world. It claims to rank fourth in production of plastics per capita and first in production of cellulose-base (rayon) fibers per capita. In the Sino-Soviet Bloc, only the USSR produces more synthetics. Nevertheless, Ulbricht acknowledged in his speech in November that the East German chemical industry was lagging behind the Free World in large-scale production of plastics and synthetic fibers and noted also that the assortment of these products needed to be expanded. He also stated that plastics and fibers were "of decisive importance in the further development of the national economy for satisfying the needs of industry and the population." Consequently, primary attention is being focused on synthetics in the expansion program of the chemical industry.

In 1965, production of plastics in East Germany is scheduled to be about 300,000 tons, or 250 percent of the planned production for 1960. The plastic expected to show the greatest absolute increase is polyvinyl chloride, production of which is to be 120,000 tons, twice that planned for 1960. Polyethylene is foremost among the plastics that are to be made for the first time in East Germany, and an optimistic goal of 50,000 tons has been reported for 1965. Production of other types of plastics also is to be increased, not only in order to expand exports to other countries of the Bloc but also to provide a greater supply and variety of input materials for the machine building industry, especially the electrical equipment industry. In addition, the increased production of plastics is expected to benefit the construction industry and to improve the lot of the East German populace by supplying more consumer goods and furnishing packaging materials for food and other products.

Production of synthetic fibers is to reach 38,000 tons in 1965, or 460 percent of that planned for 1960. Expansion plans emphasize production of wool-like synthetic fibers, Prelana and Wolerylon, which resemble Orlon, and of Lenon, which is similar to Dacron. Combined production of wool-like fibers is to be 20,000 tons,

* By March 1959 the East Germans were talking in terms of a Seven Year Plan for 1959-65 rather than a Five Year Plan for 1961-65. No major changes in the goals for production of chemicals in 1965 have been noted.

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an increase of about 900 percent more than that planned for 1960. Production of Dederon, the nylon fiber formerly called Perlon, is scheduled to increase to 13,200 tons, or 250 percent of the amount planned for 1960. The additional production of Dederon will be used chiefly to increase production of tire cord, to increase exports of stockings to other countries of the Bloc, and to provide more clothing materials for the East German people. No increase in production of artificial fibers is planned, but more of the output is to be used to produce rayon cord for tires.

The basic chemicals for production of plastics and synthetic fibers could be produced far more economically in East Germany from petroleum than from calcium carbide. Consequently, the plan calls for a great increase in the availability of petroleum by 1965. The new pipeline from the USSR is scheduled to provide nearly 5 million tons of petroleum per year by 1965, primarily for a new refinery to be built at Schwedt.

Because considerable time will elapse before petrochemicals become available, it will be necessary during the interim to expand production of calcium carbide to meet increased demands for the manufacture of synthetics. Plans call for production of calcium carbide to increase from about 831,000 tons in 1958 to 1.2 million tons by 1965. Four new carbide furnaces are to be built at VEB Chemische Werke Buna in Schkopau and two at VEB Stickstoffwerk Piesteritz in Piesteritz.

Production of fertilizer in East Germany is scheduled to be 2.8 million tons* in 1965, or 23 percent more than that planned for 1960. This modest increase is understandable because total production of fertilizer is already at a high level. Emphasis will be placed chiefly on phosphorus fertilizer. Production of this fertilizer has lagged seriously since World War II, and it has been necessary to import large quantities. The goal for production in 1965 is 250,000 tons,* or an increase of 58 percent more than the goal for 1960. Increased quantities of phosphorus ores are to be delivered by the USSR.

Production of nitrogen fertilizer is to increase only about 10 percent between 1960 and 1965 to a level of 362,000 tons.* There are two principal reasons for this relatively small increase. First, agriculture in East Germany is currently better supplied with nitrogen fertilizer than with phosphorus fertilizer. Second, East Germany exports nitrogen fertilizer to other countries of the Bloc, but because these countries plan a considerable increase in their own

* In terms of pure nutrient content.

production by 1965, their imports from East Germany are expected to decline. In line with agricultural requirements for more concentrated and multipurpose fertilizer, a reduction is planned in production of ammonium sulfate, the principal type produced at present, and two new prewar types will be reintroduced-- ammonium sulfate-nitrate (formerly called "Leuna-Salpeter") and "Nitrophos," a mixed fertilizer containing both nitrogen and phosphorus nutrients.

Extensive deposits of rich potash salts have made it possible for East Germany to become the third largest producer of potassium fertilizer in the world. About 60 percent of East German production is exported, more than half of it to the Free World. The exports are particularly important to the economy as a source of foreign exchange. Furthermore, East Germany is the chief supplier of potassium fertilizer to the European Satellites. In spite of large exports, East German agriculture is well supplied with potassium fertilizer. Domestic production is to increase to about 2.2 million tons* in 1965, 22 percent more than that planned for 1960. There is little doubt that most of the increase in production will be exported.

By 1960, exports of chemical products by East Germany are to be 22 percent more than those of 1958, and by 1965, 100 percent.** Imports in 1965 are to be 110 percent more than imports in 1958. At the same time, there is to be a change in the types of goods traded. The percentage of basic chemicals in total exports is to decrease, and the percentage of refined products is to increase. The importation of raw materials is to increase more than the importation of semifinished and finished goods, and there is also to be a shift, insofar as possible, from the Free World to other countries of the Sino-Soviet Bloc as sources of supply.

2. Other Developments

a. Production

In achieving an over-all increase in the value of production of 9.5 percent in 1958,*** the East German chemical industry showed marked advances in production of nearly all basic chemicals. In 1957, production of these same products in East Germany showed only small increases over 1956, and the over-all production of the industry increased only about 7 percent. The increased rate

* In terms of pure nutrient content.

** In 1958, chemicals accounted for about 18 percent of total East German exports.

*** The value of total industrial production increased 10.8 percent in 1958.

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of growth can be attributed primarily to two factors: (1) the enactment in December 1957 of the definitive law of the Second Five Year Plan (1956-60), after the industry had operated for the first 2 years of the plan period with makeshift plans, and (2) the completion in 1958 of construction or modernization projects which had been pending for a year or more. The latter factor probably applied particularly in the case of calcium carbide and synthetic rubber. Synthetic rubber made the most rapid progress of all chemical products, with a 13-percent increase above production in 1957, bringing production in 1958 to a higher level than that planned for 1960 in the Second Five Year Plan.

b. Construction

Construction of new plants for the East German chemical industry proceeded rather slowly during 1956 and 1957, and there is little evidence that activity was stepped up appreciably in 1958, although some construction work which had been started previously was completed during the year. For example, new capacity for production of both calcium carbide and synthetic rubber was put into operation at the Buna chemical works in Schkopau. New capacity for producing sulfuric acid at Salzwedel, Oranienburg, and Premnitz was nearing completion in October 1958 and was expected to be finished by the end of the year. Work also continued during 1958 on another sulfuric acid plant, the anhydrite plant at Coswig, which is the most important single chemical project under the Second Five Year Plan. The plant is scheduled to begin partial operation in 1960 and to reach final completion in 1963. Work also began in 1958 on the preliminary planning and designing for the major projects scheduled for the Third Five Year Plan (1961-65), including the new plants for synthetic fibers at Premnitz and Guben, and an additional sulfuric acid plant of the same size as the Coswig plant, to be built in Bezirk Karl-Marx-Stadt.

c. Reorganization

On 31 July 1958 a reorganization of the administrative structure of the chemical industry of East Germany, which had been in progress for nearly a year, became final. The functions of the former Ministry of the Chemical Industry were divided between a new Department of Chemistry in the State Planning Commission and seven "Associations of People-Owned Enterprises" (VVB's), each of which exercises administrative control over groups of plants having roughly similar types of production. This arrangement lodges a greater degree of central control of the industry in the State Planning Commission, at the same time providing more latitude for the

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individual plants in operational matters. The new organizational structure should facilitate implementation of the ambitious program for expanding the chemical industry, inasmuch as the State Planning Commission is the key point for coordinating the activities of the many branches of industry which necessarily will be involved.

3. Outlook

There is no doubt that the new program for the chemical industry has been accepted in earnest by the East German economy and that an all-out effort is being made in many branches of industry to push through the program. The investment allocations for the industry, 236 percent of investment under the Second Five Year Plan (1956-60), appear adequate, and all phases of expanding the program are to enjoy top priority. Nevertheless, the prospects of fulfilling the plan do not appear bright. The lack of petrochemical technology and shortcomings in the supply of chemical equipment, of electric power (notably for the production of calcium carbide), and of manpower are among the major problems.

The East German government has acknowledged that it will be necessary to obtain from the Free World petrochemical technology, particularly technology for producing ethylene (for polyethylene plastic) and propylene (for polypropylene plastic and for phenol synthesis), because none of the member nations of CEMA can supply such technology. If the requisite technology is not obtained soon, the program will be seriously delayed, for it is necessary to start construction of the new plants in 1959 or 1960 if the scheduled goals are to be met.

The chemical industry of East Germany has frequently complained of slow deliveries of chemical equipment, and in November 1958 Ulbricht outlined measures to improve coordination between the chemical and machine building industries. Among other things, he noted that a special enterprise was to be set up to handle procurement of complete chemical installations from the machine building enterprises. The result may be improvement in the flow of chemical equipment, but it is expected that shortages will continue, especially in view of the East German commitments to deliver chemical equipment to the USSR and other countries of the Sino-Soviet Bloc.

The main source of starting materials for production of organic chemicals in East Germany is calcium carbide, production of which requires a very large unit input of electric power. Inasmuch as electric power has been a bottleneck for chemical production in the past and inasmuch as a considerable expansion of calcium carbide production has been scheduled, it is questionable that the power supply will be adequate in the next few years.

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Manpower has already become a serious problem in East Germany because of defections to the West and fewer additions to the labor force as a result of the low birth rate during World War II. One measure being taken to deal with this problem is a program to train each chemical worker in a "second trade" so that he can, for example, maintain as well as operate equipment. Although the program may provide a partial solution to the manpower problem, continuing difficulties can be expected during the next several years, especially as new plants are scheduled to be built in the eastern areas of the country where no pool of skilled chemical workers exists. In recognition of this problem, the expansion program calls for a high degree of automation in new chemical plants.

C. Poland

1. Production in 1958

According to published statistics, the value of production of chemicals in Poland increased 16 percent in 1958 compared with 10 percent for total industrial production. Reported increases in major products were as follows: motor vehicle tires, 36 percent; pharmaceuticals, 26 percent; and fertilizer, 12 percent. Current plans call for production of 496,000 tons of fertilizer* in 1960, a goal which probably will be achieved. The 36-percent increase in production of tires partly reflects the fact that production in 1957 was seriously hampered by shortages of tire cord. Large percentage increases were recorded for steelon (nylon) synthetic fiber and polyvinyl chloride plastic, but production of these items has been initiated only recently. Of the basic chemicals, production of soda ash increased 59 percent, chiefly because a new plant was put in operation.

The initiation of production of butadiene-styrene rubber at Oswiecim, the site of Poland's first commercial synthetic rubber plant, was delayed because of process difficulties. This plant, which is of Soviet design with a capacity of 36,000 tons, will employ a high-cost, roundabout process of obtaining butadiene from acetylene derived from calcium carbide. Ethylene for production of styrene also is obtained from this same source. Production of synthetic rubber is scheduled to reach 15,000 tons in 1960, but this goal probably will not be reached.

2. New Plans

In recent months the Poles have released information on the goals for the chemical industry under the new Five Year Plan

* In terms of pure nutrient content.

(1961-65) and under the long-range plan (1961-75). During 1961-65, chemical production is scheduled to increase 107 percent, or about 16 percent per year, compared with a planned increase in total industrial production of 50 percent, or 8 percent per year. The planned rates of growth for chemicals and for total industry during 1961-65 are very close to those which apparently will be achieved during 1956-60. Over the entire period 1961-75, chemical production is scheduled to increase at a rate of 10.5 percent per year, the highest rate of growth for any industry, compared with 7.1 percent for total industrial production.

The outstanding features of the new plans for the chemical industry in Poland include a rapid increase in production of synthetic materials and development of production based on indigenous deposits of natural gas and elemental sulfur and on Soviet crude oil. Production of plastics is scheduled to increase from 63,000 tons in 1960 to 185,000 tons in 1965; production of synthetic fibers, from 5,000 to 29,000 tons; and synthetic rubber, from 15,000 to 50,000 tons. Partly because of the inadequacy of domestic sources of cellulose, production of artificial fibers (mostly rayon) is scheduled to increase only moderately from 75,000 to 85,000 tons. Production of nitrogen fertilizer is to increase from 270,000 to 480,000 tons,* and production of phosphorus fertilizer from 226,000 to 380,000 tons.*

Plans for 1961-65 include construction of a petrochemical combine at Plock, northwest of Warsaw. The main raw material for this combine will be byproduct gases of the adjacent petroleum refinery which will be built for processing crude oil piped in from the USSR. In Kedzierzyn-Blachownia, 15,000 tons of ethylene per year will be obtained by the pyrolysis of petroleum fractions.

Plans have also been drawn up to produce chemicals from natural gas. By 1965, Poland expects to utilize 500 million cubic meters of natural gas for chemical processing. Natural gas will replace coal as a source of hydrogen for the synthesis of ammonia and as a partial substitute for calcium carbide as a source of acetylene for the manufacture of synthetic fibers.

Production of elemental sulfur in Poland is scheduled to increase rapidly from the amount of 6,000 tons produced in 1958. Sulfur should provide a more economical raw material than pyrites for production of sulfuric acid. By 1961, Poland is scheduled to export sulfur, chiefly to Czechoslovakia.

* In terms of pure nutrient content.

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With a rapid expansion in production of synthetics and increased utilization of domestic raw materials such as sulfur, Poland hopes to reduce its currently heavy import balance in chemical products, chemical raw materials, and related items such as natural fibers and natural rubber. However, in expanding production of synthetics, Poland will be heavily dependent on countries of the Sino-Soviet Bloc and the Free World for technical aid and equipment.

D. Czechoslovakia

1. Production in 1958

The value of production of chemicals in Czechoslovakia reportedly increased 11 percent in 1958, or the same percentage as total industrial production. Under the Second Five Year Plan (1956-60) production of chemicals is scheduled to increase 61 percent, an average of about 10 percent annually compared with an increase of 55 percent for total industrial production.

Nitrogen fertilizer scored the largest gain in production in Czechoslovakia in 1958, 46 percent, as a result of the completion of additional capacity for production of 70,000 tons of ammonia at Most and expanded capacity for production of 54,000 tons of fertilizer at Lóvosice.* Production of nitrogen fertilizer was 108,000 tons and of phosphorus fertilizer 117,000 tons.* Production of artificial fibers increased 14 percent to 55,000 tons and of polyvinyl chloride from 4,000 tons to 4,800 tons.

2. New Plans

During 1958, Czechoslovakia revealed over-all objectives of the chemical industry for 1965. Chemical production is to increase about 150 percent compared with 1957, reportedly the largest increase for any industrial sector. Production of fertilizer will quadruple, and production of plastics will increase to 120,000 or 130,000 tons, more than four times the production of 30,000 tons in 1957. Production of artificial fibers will be increased to 95,000 tons, twice the production in 1957. In the past, expansion of the chemical industry has been hampered by shortages of chemical equipment, and the increased commitments to export chemical equipment to the USSR may have a serious effect on the domestic chemical industry.

* In terms of pure nutrient content.

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Already, Czechoslovakia is planning to exploit petroleum and natural gas as raw materials to support expansion of the chemical industry. Late in 1958, construction of a huge petrochemical combine based on indigenous natural gas was begun at Sala-nad-Vah, Slovakia. Some of the technology to be employed has been purchased from Italy. The combine will produce nitrogen fertilizer and many organic chemicals. The regime also began planning in 1958 for the use of crude oil from the USSR to be delivered by pipeline. At the Stalin Works in Zalusí (near Most), byproduct gases from the refining of crude oil will be used as the raw material for synthesizing ethyl alcohol. Draft plans for pilot-plant production of synthetic alcohol were drawn up recently by Soviet technicians. Synthetic alcohol produced at Zalusí will be used at Kralupy-nad-Vltavou for production of synthetic rubber (butadiene-styrene type), which is scheduled to begin in 1963-64. The second section of the Kralupy plant, which is scheduled for completion in 1966, will produce butadiene directly from byproduct gases, a process which the Bloc has been trying to purchase from the US. Soviet crude oil also will be used as the starting material for the production of polyethylene and polypropylene plastics.

E. Rumania

Rapid expansion of the Rumanian chemical industry, including the development of a diversified petrochemicals sector, has been occurring under the Second Five Year Plan (1956-60). In 1958, the value of production of chemicals reportedly increased 19 percent compared with 10 percent for total industrial production. In 1959, chemical production is scheduled for a further increase of 28 percent, and investment in chemicals, which is scheduled to be 50 percent greater than in 1958, will amount to about 20 percent of total industrial investment. By 1965, production is scheduled to be four times the level of 1958, an average annual increase of 22 percent. The rapid expansion of the chemical industry is being accomplished with assistance from both the Free World and the Sino-Soviet Bloc, particularly the USSR. From the West, Rumania is assiduously seeking aid in the building of facilities for producing tires, plastics, synthetic fibers and intermediate chemicals, including petrochemicals. Recently, a contract was signed with a Belgian firm for purchase of a plant to produce acetylene from natural gas. Negotiations are under way for purchase of tire and rayon plants. Interest has been expressed in purchasing all types of petrochemical processes.

The very substantial increase in chemical production in Rumania in 1958 resulted in part from an increase of 59 percent in production of fertilizer to 152,000 tons. Production of soda ash increased 24 percent to 83,000 tons and that of caustic soda 23 percent to 41,000 tons.

Production of fertilizer in Rumania will continue to expand rapidly in 1959 and in subsequent years. The plans for 1959 call for production of 282,000 tons, and the goal for 1960, which probably will be achieved, is 500,000 tons. Production is expected to reach 1.5 million tons by 1965, and 2.5 million to 3.0 million tons by 1970. All the new capacity for production of nitrogen fertilizer will be based on hydrogen derived from natural gas.

Production of synthetic materials, mostly formaldehyde resins and polyvinyl chloride, is scheduled to increase from 2,000 tons to 6,000 tons in 1959. By 1961, Rumania is expected to begin production of synthetic rubber (butadiene-styrene copolymer) with butadiene obtained directly from byproduct gases from the refining of crude oil, using the latest technology. Plans for a synthetic rubber combine located at Borzesti reportedly have been drawn up by Soviet specialists, and the USSR is supplying much of the equipment and training and Rumanian cadres. This development is interesting in view of Soviet problems with this process at the Sumgait plant and the current efforts of the USSR to purchase such a process from the US. At Borzesti the USSR also is installing a unit for synthesizing phenol with acetone as a joint product by the modern cumene peroxidation process from benzene and propylene.

F. Hungary

1. Developments in 1958

According to official indexes, the value of production by the chemical industry in Hungary increased 19 percent in 1958 compared with an increase of 15 percent for total industrial production.* The increase for chemicals was well above the average rate of 10 percent required to fulfill the Three Year Plan (1958-60), an interim plan drafted to replace the discarded Second Five Year Plan (1956-60). The substantial increase in chemical production was achieved in part through large increases in the production of fertilizer and pharmaceuticals.

Production of fertilizer in Hungary increased from 243,000 tons to 358,000 tons, an increase of 47 percent. Production of nitrogen fertilizer increased from 80,000 tons to 153,000 tons, largely as a result of the reinitiation of production at the Borsod nitrogen products plant (Kazincbarcika) in mid-1958. Construction of additional capacity to produce 200,000 tons of superphosphate and 130,000 tons of nitrogen fertilizer is now under way.

* By state-owned industry only. According to Hungarian definition, the chemical industry also includes the refining of petroleum, the manufacture of aluminum, and the fabrication of rubber products.

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The production of several pharmaceutical products, notably superseptyl, papaverin hydrochloride, and chloromycetin increased markedly in 1958. The increases reflect the new Hungarian policy to develop the pharmaceutical sector. Pharmaceutical production is scheduled to increase 43 percent during 1958-60, and the three largest pharmaceutical plants in Hungary are being modernized and expanded. Hungary has been an important producer and exporter of pharmaceuticals for more than 50 years, but during the postwar period the facilities of the industry have been allowed to grow obsolete.

In July 1958 the first unit in Hungary for production of refined benzene, a starting material for the production of plastics, synthetic fibers, and many other organic chemicals, reportedly was completed at the Stalinvaros Metallurgical Combine. Nearing completion at this same site are units for production of other coke chemicals such as toluol, phenol, and naphthalene.

A petrochemicals combine which will operate on natural gas from Rumania and which will produce plastics, fertilizers, and other products has been under construction at Tiszapalkonya since 1956. Technology and equipment for producing acetylene from natural gas have been sought from West Germany. A portion of the remaining equipment will be supplied by the USSR and East Germany. Little recent progress in construction has been evident, although a pipeline 360 kilometers long to transport natural gas from Rumania was completed in 1958. No concrete plans for producing chemicals from by-product gases from the refining of crude oil have been announced as yet, but this source will no doubt be tapped after completion of the pipeline to deliver crude oil from the USSR.

2. New Plans

Under the new Five-Year Plan (1961-65), annual investment in the chemical industry in Hungary is to be more than twice the current rate.* Production by the industry is scheduled to increase about 100 to 150 percent during 1959-65. A large share of the allocated funds will be used to expand production of synthetics, fertilizer, and pharmaceuticals. Production of plastics is scheduled to increase from the current level of 6,000 to 7,000 tons per year to 50,000 to 60,000 tons, and synthetic fibers from 300 tons to 3,000 to 4,000 tons.

* Including investment in inorganic, coal processing, organic, pharmaceutical, and rubber sectors.

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G. Bulgaria

1. Production in 1958

The value of production of chemicals in Bulgaria reportedly increased 22 percent in 1958 compared with an increase of 16 percent in total industrial production. Of the major chemical products, fertilizer showed the largest percentage increase in production -- from 138,000 to 207,000 tons. This increase was mostly in the production of superphosphate fertilizer, which Bulgaria did not begin to produce until 1957. Increases in production of caustic soda and calcium carbide were modest.

2. New Plans

Under the new plan to fulfill the Third Five Year Plan (1958-62) in 3 to 4 years, production of chemicals in Bulgaria is scheduled to triple by 1962 rather than be 2.5 times production of 1957 as originally planned. By comparison, total industrial production is now scheduled to double rather than increase by 62 percent. By 1965, chemical production is to be at least four to five times the level of production in 1957. Among the goals for 1965 are the following: 1.6 million tons of fertilizer, 30,000 to 40,000 tons of plastics (including polyvinyl chloride and polyethylene), and 26,000 tons of artificial fibers. Plans call for production of plastics from petroleum byproducts by 1965.

H. Communist China

1. Developments in 1958

a. Fulfillment of the Plan for 1958

The value of production by the chemical industry in Communist China is estimated to have increased 56 percent in 1958 compared with an estimated increase in total industrial production of 40 percent. According to official statistics, production of antibiotics increased 319 percent to 145 tons; soda ash, 36 percent to 640,000 tons; caustic soda, 29 percent to 270,000 tons; and sulfuric acid, 17 percent to 740,000 tons. According to press reports based on "preliminary data," production of motor vehicle tires increased 97 percent to 1.7 million units,* and to support this increase requirements for natural rubber reportedly increased more than 80 percent. Production of fertilizer is estimated to have increased from 0.8 million tons to 1.3 million tons.

* This total may be high, for production may not have exceeded 1.0 million units according to estimates of this Office.

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b. Program for Production of Fertilizer

The key aspect of the Second Five Year Plan (1958-62) for the chemical industry in Communist China is expanded production of fertilizer. The original goal for 1962 was 3 million to 3.2 million tons, an impressive increase above production of about 0.8 million tons in 1957. In successive revisions, however, the goal was raised to 5 million to 7 million tons, to 10 million tons, to 15 million to 20 million tons, and to 25 million tons, and most recently a goal of 35 million tons has been discussed.

A novel feature of the latest version of the plan for production of fertilizer is the intention to construct an extensive network of small plants with capacities of 8,000 and 40,000 tons to produce ammonium bicarbonate, a new type of chemical fertilizer which is almost 85 percent as effective as the ammonium sulfate traditionally used as a nitrogen fertilizer in China. At least one 8,000-ton plant is to be built in each of the 2,000 hsien (counties), and one 40,000-ton plant in each of the 200 provinces. Production from these plants would add, all told, about 24 million tons annually to the supply of chemical fertilizer in Communist China.

During 1958, there had been increasing evidence of difficulties with the program for ammonium bicarbonate. First, no comment has been forthcoming from Chinese Communist sources in recent months with respect to the highly publicized prototype plant erected in Shanghai in May 1958. Because of the attention previously centered on this plant, at which successful trial production was considered necessary before similar plants could be built throughout China, the omission of subsequent comment is significant. Second, in December 1958, a vice minister of the chemical industry did not include ammonium bicarbonate among a list of chemical products which he indicated were scheduled for large-scale development in 1959. Third, in November 1958 a Chinese Communist trade mission visiting Western Europe expressed interest in purchasing equipment sufficient for 2,000 plants for making nitrophosphate fertilizer, an inquiry which suggests that the program for ammonium bicarbonate may have been abandoned.

The Chinese Communists have stated that 90 percent of the equipment to be used in expanding production of fertilizer would be produced domestically, and the regime has claimed the capability for serial production of complex high-pressure converters for synthetic ammonia by using newly developed techniques of welding and casting. In January 1958, however, trial manufacture of equipment to produce fertilizer was described as "unprecedentedly cumbrous,"

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and Chinese news reports reflect the skepticism of some of the planners about China's ability to produce the required equipment.

In an attempt to augment the program for increasing production of fertilizer in Communist China, a massive campaign on the local level was inaugurated in 1958 to collect fertilizer materials and to produce fertilizer on a small scale.* The program was credited with considerable significance in the crop yields of 1958. This program probably will continue for some time as a stop-gap measure, but the regime has emphasized that the fundamental solution to the problem of the shortage of soil nutrients in China lies in the development of a large-scale fertilizer industry.

c. Synthetic Materials

Although the program for production of fertilizer has received most of the publicity, Communist China has plans to produce substantial quantities of plastics and chemical fibers by 1962. In 1957, China produced only about 10,000 tons of plastics, mostly phenolics. Production of synthetic rubber and chemical fibers was negligible. The announced goals for production in 1962 are 200,000 tons of plastics and 120,000 tons of chemical fibers, mostly rayon.

In 1958 a number of plants for producing plastics and chemical fibers were under construction in Communist China, with substantial aid from East Germany and the USSR. In the synthetic rubber sector, a plant for the production of butadiene-styrene synthetic rubber from calcium carbide is being built at Kirin. At Lanchow, construction of a second plant for producing the same type of synthetic rubber, in this case based on ethyl alcohol derived from petroleum byproducts, is scheduled to begin in 1959. Both of these plants are being built with Soviet aid.

d. Foreign Trade in Chemicals

With the rapid growth of the chemical industry the dependence of Communist China on imports has gradually lessened, and limited but increasing quantities of certain chemical products are being exported. During 1958, pharmaceuticals were sold in Southeast Asia, and dyes were offered for sale in Western Europe, but China continued to depend heavily on foreign sources for fertilizer. Imports of fertilizer amounted to about 1.5 million tons in 1958.**

* Estimates of production of fertilizer in 1958 as well as the goals for 1962 exclude such so-called "native-type" fertilizer.

** Communist China imports more nitrogen fertilizer than any other country in the world and in 1958 reportedly succeeded in obtaining preferential prices on imports of ammonium sulfate and calcium ammonium nitrate from Western European suppliers.

Chinese Communist imports of natural rubber are estimated to have increased from 51,000 tons in 1955 to 97,000 tons in 1956, to 118,000 tons in 1957, and to 152,000 tons in 1958.

2. Outlook

Late in 1957, Communist China acknowledged that the chemical industry was the fourth most important industry after coal, iron and steel, and petroleum. With its current high priority the chemical industry is expected to become one of the main producers of heavy chemicals in the Sino-Soviet Bloc by 1962. However, the specific goals established for 1962, particularly the goals for production of fertilizer and synthetics, appear to be far too ambitious in view of China's limited technical and equipment-producing capabilities.

I. North Korea

The value of production of chemicals in North Korea is estimated to have increased about 24 percent in 1958 compared with a reported increase of about 40 percent in total industrial production. Production of fertilizer increased 40 percent to 457,000 tons, and production of caustic soda increased 51 percent to 14,000 tons. The increase in production of fertilizer resulted primarily from the opening of a Soviet-built ammonium nitrate unit at the Hungnam Fertilizer Plant.

Continued rapid growth of the chemical industry is planned under the current Five Year Plan (1957-61), which North Korea now claims will be fulfilled well ahead of schedule. Production by the Ministry of the Chemical Industry is to increase 87 percent in 1959, and, according to press statements, achievement of this increase would mean that in 1959 the original goal for 1961 would be substantially exceeded. The revised goal for production of fertilizer in 1961 is 760,000 tons, and the goal for 1965 is 1.5 million to 2.0 million tons. Substantial increases are planned in production of artificial fibers, from 8,000 tons in 1958 to 25,000 to 30,000 tons in 1961. Plants for producing 10,000 tons of "vinalon" * and 10,000 tons of polyvinyl chloride are to be in partial operation by 1961. Increased production of artificial fibers is expected to permit a reduction in imports of cotton and wool.

* May be polyvinyl alcohol plastic.